DEVELOPMENT AND VALIDATION OF AN EXERCISE DEVICE FOR USE IN AN LBNP BOX

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INTRODUCTION: The LBNP box is widely used to study cardiovascular physiology, orthostatic intolerance and responses to exercise. An exercise multiplatform (ENTIRETY) was constructed for use in an LBNP box. The study evaluated physiological responses and perceived exertion (RPE) during 5 min of exercise using ENTIRETY in supine and standing positions. METHODS: Six subjects (28.8±10.9yr, 64.8±11.2kg,163.2±6.9cm) had heart rate (HR), oxygen consumption (VO_2), carbon dioxide production (VCO_2), respiratory exchange ratio (RER), electromyography of the VL and VM muscles (sEMG), and Borg scale RPE measured at rest and during exercise in both body positions. RESULTS: Increased HR during the 5 min exercise was not affected by body position. However, a decrease in VO_2 and VCO_2 (29.34±22.79ml/kg/min; 26.30±6.66ml/kg/min) mean measurements for the supine position in comparison to the orthostatic position (14.2±4.45ml/kg/min; 18.40±4.55ml/kg/min) ($P<0.05$) was observed. The mean RER showed no significant difference between the supine (1.16±0.37) and standing (1.28±0.11) positions. The mean RPE was higher in the supine position (6.67±2.83 points) than in the standing (4.83±2.85 points) ($P<0.05$). Comparison of the sEMG showed higher average activation of the VM and VL muscles in the supine position (18.88±5.15mV; 14.88±6.09mV) than in the standing (12.62±4.25mV; 8.42±3.45mV) ($P<0.05$). DISCUSSION: Performance of exercise while standing requires a greater metabolic response due to the effect of gravity on the individual at the Gz axis, which is decreased in the supine position. These results are in accordance with findings from the scientific literature and therefore validate the use of the ENTIRETY exercise device in LBNP studies. Thus, ENTIRETY could present greater potential of use for muscle and cardiovascular conditioning, when individuals exercise in supine and standing positions, respectively.

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